

## WE CLAIM:

1. A network path selection method comprising:

maintaining a network topology repository comprising  
a plurality of nodes and a plurality of links interconnecting  
5 the nodes, the network topology further comprising a weighted  
BE (best effort) connection metric for each of the plurality of  
links;

to determine a path from a source to a destination  
having a requested BE service volume:

10 a) creating a virtual topology in which all  
links have weighted BE metrics updated to include the effects  
of the requested BE service volume;

b) identifying a best path through the virtual  
topology taking into account the weighted BE metrics.

15 2. A method according to claim 1 wherein the weighted BE  
connection metric takes into account only BE connection service  
volumes.

3. A method according to claim 1 wherein the weighted BE  
connection metric for a given link takes into account BE  
20 connection service volumes on the given link, and a remaining  
capacity on the given link taking into account other traffic  
classes.

4. A method according to claim 1 further comprising:  
setting aside a fraction of each link's capacity to  
25 be made available for BE traffic.

5. A method according to claim 1 further comprising:

computing the weighted BE connection metrics in a manner which encourages making use of at least a portion of unused bandwidth which is reserved for other traffic classes.

5 6. A method according to claim 1 wherein the weighted BE connection metric for each of the plurality of links is determined according to

$$M_k = \sum w_i$$

where  $M_k$  is the metric for a kth of the plurality of links,  
10 where  $\sum w_i$  = a sum of previously requested BE connection service volumes, where  $w_i$  is a service volume for the ith previously requested BE connection.

7. A method according to claim 1 wherein the weighted BE connection metric for each of the plurality of links is  
15 determined according to:

$$M_k = \sum w_i / X$$

where  $M_k$  is the metric for a kth of the plurality of links,  
where  $\sum w_i$  = a sum of previously requested BE connection service volumes, where  $w_i$  is a service volume bandwidth for the ith  
20 previously requested BE connection, and where X is a quantity which introduces effects of other traffic classes, with X being larger when the particular link has more capacity available for BE traffic, and X being smaller when the particular link has less capacity available for BE traffic.

25 8. A method according to claim 1 wherein the weighted BE connection metric for each of the plurality of links is determined according to:

$$M_k = \sum w_i / (\delta((1-\alpha)C - \sum(\text{Reserved bandwidth of non-BE}) + \alpha C)$$

where:

$M_k$  is the metric for a kth of the plurality of links;

$\sum w_i$  = a sum of the previously requested BE connection service volumes, where  $w_i$  is a service volume for the  $i$ th BE connection;

$C$  = total capacity of the link;

$\delta$  = a scaling constant ( $0 \leq \delta \leq 1$ ) determining the fraction of remaining unreserved bandwidth of higher priority traffic classes which is to be made available for BE traffic;

$\alpha$  = fraction of total capacity  $C$  to be set aside for reservation by BE connections; and

$\Sigma(\text{Reserved bandwidth of non-BE})$  = the sum of all non-BE bandwidth reserved on the link.

9. A method according to claim 1 wherein the step of identifying a best path through the virtual topology taking into account the weighted BE metrics is performed using a multi-constraint routing algorithm which also takes into account at least one of:

administrative costs, edge disjointness, node disjointness, and shared risk link group disjointness for protection/restoration paths.

10. A method comprising:

computing a weighted BE connection metric for a link;

advertising the weighted BE connection metric within a network.

11. A method according to claim 10 where the weighted BE connection metric within a network is advertised as part of a modified OSPF-TE (Open Shortest Path First - Traffic Engineering) link state advertisement.

5 12. A network component adapted to perform path selection, the component comprising:

a network topology repository identifying a network topology comprising a plurality of nodes and a plurality of links interconnecting the nodes, the network topology further  
10 comprising a weighted BE (best effort) connection metric for each of the plurality of links;

a network path selecting component adapted to determine a path from a source to a destination having a requested BE service volume by:

15 a) creating a virtual topology in which all links in the network topology have weighted BE metrics updated to include the effects of the requested BE service volume;

b) identifying a best path through the virtual topology taking into account the weighted BE metrics.

20 13. A network component according to claim 12 wherein the weighted BE connection metric takes into account only BE connection service volumes.

14. A network component according to claim 12 wherein the weighted BE connection metric for a given link takes into  
25 account BE connection service volumes on the given link, and a remaining capacity on the given link taking into account other traffic classes.

15. A network component according to claim 12 wherein a fraction of each link's capacity is set aside to be made available for BE traffic.

16. A network component according to claim 12 wherein:

5 the network path selecting component is adapted to compute the weighted BE connection metrics in a manner which encourages making use of at least a portion of unused bandwidth which is reserved for other traffic classes.

10 17. A network component according to claim 12 wherein the weighted BE connection metric for each of the plurality of links is determined according to

$$M_k = \Sigma w_i$$

15 where  $M_k$  is the metric for a kth of the plurality of links, where  $\Sigma w_i$  = a sum of previously requested BE connection service volumes, where  $w_i$  is a service volume for the ith previously requested BE connection.

18. A network component according to claim 12 wherein the weighted BE connection metric for each of the plurality of links is determined according to:

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$$M_k = \Sigma w_i / X$$

where  $M_k$  is the metric for a kth of the plurality of links, where  $\Sigma w_i$  = a sum of previously requested BE connection service volumes, where  $w_i$  is a service volume bandwidth for the ith previously requested BE connection, and where  $X$  is a quantity  
25 which introduces effects of other traffic classes, with  $X$  being larger when the particular link has more capacity available for BE traffic, and  $X$  being smaller when the particular link has less capacity available for BE traffic.

19. A network component according to claim 12 wherein the weighted BE connection metric for each of the plurality of links is determined according to:

$$M_k = \sum w_i / (\delta((1-\alpha)C - \sum(\text{Reserved bandwidth of non-BE}) + \alpha C)$$

5 where:

$M_k$  is the metric for a kth of the plurality of links;

$\sum w_i$  = a sum of the previously requested BE connection service volumes, where  $w_i$  is a service volume for the  $i$ th BE connection;

10  $C$  = total capacity of the link;

$\delta$  = a scaling constant ( $0 \leq \delta \leq 1$ ) determining the fraction of remaining unreserved bandwidth of higher priority traffic classes which is to be made available for BE traffic;

15  $\alpha$  = fraction of total capacity  $C$  to be set aside for reservation by BE connections; and

$\sum(\text{Reserved bandwidth of non-BE})$  = the sum of all non-BE bandwidth reserved on the link.

20. A network component according to claim 12 wherein identifying a best path through the virtual topology taking into account the weighted BE metrics is performed using a multi-constraint routing algorithm which also takes into account at least one of:

25 administrative costs, edge disjointness, node disjointness, and shared risk link group disjointness for protection/restoration paths.

21. A network component comprising:

means for computing a weighted BE connection metric  
for a link;

means for advertising the weighted BE connection  
5 metric within a network.

22. A network component according to claim 21 where the  
weighted BE connection metric within a network is advertised as  
part of a modified OSPF-TE (Open Shortest Path First - Traffic  
Engineering) link state advertisement.

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